following compounds caused repulsion: organic and inorganic acids, alkalies, alcohol, calcium nitrate, magnesium sulfate, sodium chloride, potassium nitrate, chlorate and chloride. The nutrient value of a substance, it is said, in no way corresponds to its chemotropic stimulus. Glycerin is cited as example of a good food which has scarcely any chemotropic action. The five molds were specially attracted by sugar, while the Botrytis showed a special preference for meat extract and peptone and no liking for grape or cane sugar. The pollen tubes were indifferent to meat extract, peptone and asparagin, but were attracted by grape sugar, cane sugar, dextrin and plum decoction. The title of this paper is *Ueber Chemotropismus der Pilze.* It occupies all of *Botanische Zeitung.* 52 Jahrg. 1 Abt. Heft I., and is well worth reading by all who are interested in the cultivation of fungi.

—Erwin F. Smith.

ZOOLOGY.

Origin of Life.—The following interesting speculation as to the origin of the organic forms of the earth is advanced by Mr. Charles Morris. There was a time in the earth's history, when chemical inaction prevailed, on account of high temperature and unfavorable physical conditions, but, on the formation of an ocean of highly heated waters, holding in solution a variety of elementary substances and simple compounds, chemism grew active, and became more energetic as the waters increased in depth and in variety and volume of their contents. Many complex minerals were very likely then formed and deposited as rock formations. As the ocean became freed from its abundance of foreign material inorganic chemistry decreased, until now it has practically ceased, oxidation having reduced nearly all substances to a state of chemical fixity.

As the waters of the primeval ocean slowly cooled, and inorganic chemism declined in activity, organic chemism probably set in, aided by the solar rays. The material for this new phase of action had been prepared and existed abundantly in the water and air. It may have had its origin in an early reaction between carbon dioxide and the elements of water, yielding the hydro-carbons; and subsequently between these and nitrogen, yielding the far more complex albuminous compounds.

Many of the preceding mineral molecules were quite complex in composition, and it is reasonable to suppose that still more complex molecules arose under conditions restraining the activity of oxygen. Seed forms of organic substance may have first appeared—simple carbon compounds. These would serve as the basis of more complex molecules, and there may have been a long-continued process of deoxidation and formation of higher carbon and nitrogen compounds until true organic matter appeared and the chemistry of life came fairly into play.

Further the author remarks that "the conditions favoring the development of organic material were transitory, and no longer exist. Organic chemistry emerged from a vitally active stage of inorganic chemistry. It could not well arise from the existing passive stage of inorganic chemistry." (Proceeds. Acad. Nat. Sci., Phila., 1897).

The Life Cycle of the Coccidii of Arthropods.[1]—During the course of his researches on the Sporozoa of Arthropods Liger came to the conclusion that the form that has been described under the name of Eimeria is not an independent animal but only a form in the life cycle of Coccidium. In the intestine of myriopods and of insects, embracing species of Himantarium, Stigmatogaster, Lithobius, Cryptops, and Tipula, two forms of the parasites were always present. In the myriopods there could be recognized, (1) cysts of Eimeria, growing and mature, enclosing numerous sporozoids regularly disposed and enveloped in a delicate wall; (2) free active sporozoids, that might be seen in the process of becoming detached from those just noted; (3) intracellular forms, among which one might recognize all the transitional forms between the sporozoids just noted and the encapsuled form marking the end of the period of growth; (4) encapsuled forms, free or still intra-cellular and showing the beginning of the division of their contents into four granular masses; (5) these same cysts in a mature condition with four oval spores each containing two sporozoids.

An examination of the excrement of a Himantarium that was later found infested showed the existence there of the cysts of Coccidium, which are to be considered as giving rise to Eimeria. The sporozoids of Eimeria were found incapable of existing in water. As further supporting his position he cites the fact that when Coccidium is present, so is Eimeria, and when one is absent, so is the other. This coëxistence of the two forms in the same animal has been long known, and it is added that an arthropod has never been found containing a Coccidium with lasting spores that did not also harbor an Eimerian form.

[1] L. Liger. C. R. Acd. Sci., CXXIV, pp. 966.

Summarizing his facts he states that the cycle of the Coccidium is as follows:

"Eimerian sporozoid, encapsuled form, tetra-spored cyst (Coccidium), Coccidian sporozoid (that enters the host), eimerian bud-group, and then the Eimerian sporozoid.

In a promised paper the author expects to show the relation between a coccidium and a gregarine, but not by an identification with a morocystial as Mingazine has attempted to do nor by a doubling of the cycle as Schneider did, but by considering the Eimerian sporozoid as equivalent to the gregarine sporo-blast and the lasting tetra-spored cyst of a Coccidium as the analogue of the gregarine spore.

The Nephridia of the Nemertine, Stichostemma eilhardi Montg.—A brief paper on this subject by Dr. Montgomery contains some very striking facts, which have a somewhat important bearing upon the weight to be given nephridia in constructing phylogenetic trees. As a case in variation the worm described simply adds another example to those that have been accumulated showing that the forms of animals, of plants, the number of various portions of their anatomy, etc. are much less fixed and regular than has been previously supposed.

This particular worm we are informed differs from all other known nemerteans (1) in having several consecutive nephridia on each side of the body instead of a single pair as is the case in others forms; (2) in the fact that not all of the nephridia are provided with excretory ducts; (3) in the nephridia extending from one end of the body to the other; (4) in the great number of excretory ducts; (5) in the cavity of the terminal bulbs being closed and hence not in open communication with the lumen of the ductules; (6) in the presence of a closed cuticular structure surrounding the cavity of the bulb which may be produced by the cells of the latter; (7) in the probable absence of a ciliary flame in the bulb; (8) in the comparative great length of the ductule connecting the bulb with the main duct; and (9) in the possession by the epithelium of the main ducts of a cuticula of considerable thickness.

No evidence of a connection between the nephridia and the blood vessels was found.

The peculiar features of the animal the author seeks to explain as due to the adaptation of the ancestors of the worm from a marine to a fresh water life. There is a question, however, as to whether such a cause is properly assumed for the peculiarity of consecutive nephridia instead of the single pair found in all other nemertines, and for the irregularities to be noted in the supply of excretory ducts. As shown by the

author's diagram the nephridia look fragmentary; there is no regularity in their length, nor do the numbers of the fragments show evidence of bilateral symmetry. But the author himself suggests that the specimen may be a monstrosity, and that a study of other specimens might show both bilateral symmetry and more regularity in the arrangement on each side. Such a further study is certainly needed. Until it is made one might very reasonably suppose that it is possible that the nemertine nephridia and their ducts are not stable in their arrangement. And this supposition would be supported by the fact that in Pauropus, —an animal much higher in the scale of life than the nemertine worm in question and therefore, according to general opinion, probably less likely to vary,—one finds the seminal ducts (metamorphosed nephridia) coiled upon themselves and anastomased in a most peculiar, manner with no evidence of bilateral symmetry and showing no evidence of constancy of arrangement or in the position of the three small ducts leading from the testes in different individuals. Further one frequently finds that portions of the large ducts have become cut off from the remainder and left without communication with the exterior, very much as is shown to be the case with the ductless nephridia in Dr. Montgomery's figure.

Description of a Remarkable Japanese Cirripede.—SCALPELLUM SEXCORNUTUM n. sp. General form of capitulum triangular, the ventral side nearly straight, dorsal convex; upper whorl of plates perfectly and normally calcified, lower whorl with small, peculiar plates. Valves 13. Surface everywhere densely and minutely pilose. *Carina* simply bow-shaped, weakly arched, the apex or umbo terminal above, roof strongly convex, with "eaves" or projecting carinæ at the sides, below which the side walls have some radial striæ. *Tergum* long, triangular, the carinal margin long. All margins rather straight, surface with some radial striation and a wide, but not well defined median rib, the apex erect, pointed. *Scutum* convex, subtriangular, decidedly less in area than the tergum, the occludent margin slightly concave, tergal margin straight, lateral and basal margins convex, surface radially striated. *Upper latus* somewhat triangular, the umbo above, at the apex; scutal margin long, concave, carino-basal margin convex. *Rostrum* triangular, as wide as long, the beak upturned and somewhat projecting. *Rostral latus, carinal latus* and *subcarina* developed as curved, projecting spikes or horns, small at their bases. No infra-median latus or subrostral plate. "Thorax"

Scalpellum sexcornutum Pils.

largely unprotected, collapsed in the dry specimens described. Peduncle rather short, not large, with small, sparse and separated conic scales.

Height of capitulum 18, breadth at base 11 mm.

The specimens described were collected by Mr. Frederick Stearns, and one of the cotypes is in his noble collection of Japanese invertebrates in Detroit, Mich., the other being in the museum of the Academy of Natural Sciences of Philadelphia.

The capitulum is covered with a soft dense pile, like *S. villosum* and *S. trispinosum;* but these are Pollicipeo-like species, very unlike *sexcornutum.* From all other species of similar contour, the peculiar development of the whole lower whorl of plates as projecting horns, will readily distinguish this species, which is apparentiy nearer *S. squamuliferum* Weltner (S.-B. Ges. Naturforsch. Fr. Berlin, 1894, p. 80) than any other described form. None of the forms described but not yet figured by Aurivillius (Ofversigt Kongl. Vet. Akad. Förh. 1892) seem at all similar.

It may be mentioned in this connection that the Japanese species described by me in 1890 as *Scalpellum Stearnsii* was redescribed in 1891 as *S. calcariferum* by my lamented friend Dr. Paul Fisher (Bull. Soc. Zool. de France, April, 1891, p. 117).

It is likely that these "horns," while certainly inefficient as an armour for the thoracic region, may be protective in function, as their acute, projecting points probably could not be comfortably masticated. —Henry A. Pilsbry.

The Orthoptera classified according to the characters of the Intestine.[2]—Continuing his studies upon the intestine and its appendages in the group of Orthoptera Bordas has made use of the facts in a classification of the group. The presence or absence of cœcal diverticula permits him to form two suborders, Colotasia and Acolotasia, and the number and arrangment of the Malpighian tubules allow him to decide each suborder into several families. Seven families in all are recognized. Until the first suborder, Acolotasia, distinguished by the absence of cæca the two families Phasmidæ and Forficulidæ are placed, which under the second suborder, Colotasia, the following five families are distinguished by the characters and in the order given:

(1) Blattidæ by a well developed gizzard, eight cæca, and by the Malpighian tubes being grouped in six fascicles.

(2) Mantidæ by a rudimentary gizzard and eight cæca, and by voluminous salivory glands.

[2] L. Bordas. Classification des Orthoptères d'après les caractères tirés de l'appareil digestif Compt. Rend., CXXIV, 821–3.

(3) Acridiidæ by six cæca each with a posterior diverticulum and by the absence of a gizzard.

(4) Locustidæ by a voluminous gizzard with six rows of chitinous teeth, by two large cæca, and by the numerous Malpighian tubes opening at the summit of small conical tubercles.

(5) Gryllidæ by a large gizzard thickly armed with chitinous teeth, by two cæca, and by the Malpighian tubules being grouped into large fascicles that empty at the enlarged extremity of an efferent canal playing the role of ureter.

A Preserve of Black Foxes.—A few years ago a tourist, convinced that the extermination of the Black Fox was but a question of a few years at the most, purchased an island, Outer Heron, at the mouth of the Maine, off the port of Boothbay, with the intention of establishing there a colony of the animals in which he was interested. He imported from Alaska thirty individuals, only seven of which survived the long voyage. These were liberated on the island, which is well wooded and watered, and were provided with a guard, whose duty it is to look after the increase of the original seven. They are fed on horse meat, which is left in the forest for them, but they themselves forage along the shore for fish and mollusks thrown up by the sea. They live for the most part about the coast, seeking shelter in the clefts of the rocks.

The owner finds his venture quite a profitable one, having arranged with a London firm to dispose of the skins of the surplus of his pack. (Revue Scientif., Avril, 1897.)

D. G. Elliott and his party obtained 125 species of birds during their expedition through Somali-land. A list of these species has been compiled by Mr. Elliott, who subjoins each species named with the field note pertaining to it. The author gives much valuable information concerning the habits of these African birds. A new Kestral is described, *Cherchuis fieldii*, and 7 other new forms representing the families Turdidæ, Sylviidæ, Alandidæ and Ploceidæ. The latter family, however, has only a subspecies representative. (Pub. 17, Field Col. Mus.. Ornith. ser., Vol. I, No. 2, 1897.)

A resumé of the species of known Costa Rican mammals is given by J. A. Allen. The total number of species enumerated is 121, of these 10 species are. domesticated animals, and 4 are introduced species of Mus, leaving 107 as indigenous to Costa Rica. (Bull. Amer. Mus. Nat. Hist., Vol. IX, 1897.)

Metamorphoses of Leptocephalus brevirostris.—A description of the transformation of *Leptocephalus brevirostris* into *Anguilla vulgaris* has been published by G. B. Grassi and Dr. Caulandruccio. The reality of the metamorphoses described has been confirmed by the characteristics of another specimen of *L. brevirostris* captured last January by Dr. Silvestri in the Straits of Messina. (1) The head and point of the tail has noticeably acquired the special characteristics of the eel. (2) The larval teeth have totally disappeared, while the distinctive ones seem entirely absent. (3) It lacks all traces of pigment. (Atti della Reale Accad. Lincei, VI, 1897, p. 239.)

ENTOMOLOGY.[1]

An Ant-Inhabiting Mite.—M. Charles Janet continues his interesting records of Myrmecophilous insects (Comptes Rendus, 1897, p. 583–585). His latest study relates to the peculiar mite *Antennophorus uhlmanni* and its host *Lasius mixtus*. The mite lives on the ant as an epizoön. "It fixes itself on the lower surface of the head or on the sides of the abdomen of its host by means of the carunculæ in which its feet terminate, and which are furnished with a very adhesive sticky substance.

These parasites are blind, but the first pair of feet is transformed into long antenniform appendages provided with very sensitive olfactory organs. They do not wander about in the galleries of the nest, but walks over the bodies of the ants, passing from one to another. When an *Antennophorus*, detached from the body of an ant, lies upon the soil in one of the galleries of the nest, it raises and stretches forward its first pair of ambulatory feet and at the same time it explores the space around it with its long antenniform feet. These appendages are much more agitated when an ant passes close by. If it pass near enough, the Acarid glues itself on to its body by means of the cup of sticky material on the end of one of its ambulatory feet, which it holds up ready for this operation, and it can in this way soon climb up and fix itself in a good position on its host. This latter is surprised, and seeks to rid itself of the new comer, but failing in this it becomes resigned very quickly as soon as the Acarid has taken up one of its normal positions.

[1] Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.